PATENT SPECIFICATION

691,197

Date of Application and filing Complete Specification: June 5, 1950.

No. 13985/50.

Complete Specification Published: May 6, 1953.

Index at acceptance:—Class 29, G6(b : d : k).

COMPLETE SPECIFICATION

Improvements in or relating to Methods and Apparatus for Producing and Harvesting Ice Blocks

I, EUGEN WILBUSHEWICH, an Israelian citizen, of Nazareth Street, Haifa, Israel, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a method and apparatus for producing and harvesting ice blocks.

According to the invention a method of producing ice blocks in and harvesting from an upright mould having a bottom adapted to swing about a horizontal axis, consists in holding the said bottom lightly closed against the mould and commencing the freezing action prior to or simultaneously with filling the mould, to cause the said bottom to adhere to the mould by the freezing of residual liquid or liquid introduced into the mould, and subsequent to the formation of an ice block, commencing a thawing action to cause the block to become detached from the mould and to displace the bottom.

According to a further feature of the invention a machine for carrying out the above method comprises one or more upright moulds associated in direct heat exchange relationship with the evaporator of a refrigeration plant, each mould having a bottom adapted to swing about a horizontal axis and means for normally holding each of said bottoms in its closed position, said means being capable of being overcome to allow each bottom to swing open automatically when the weight of an ice block is applied thereto.

An ice machine according to the invention has the advantage that it can be run in a fully automatic way.

An embodiment of the invention is illustrated, by way of example only, in the accompanying drawing which is a vertical section through any two cans of a battery.

The drawing shows two freezing cans 1, 2, forming part of a battery which comprises a larger number of cans, say up to twelve, arranged in two parallel rows. For the sake of description the two cans 1 and 2 are shown in two different stages of the freezing operation. In practice it is advisable to run all the cans of one and the same battery simultaneously through the same stages of the freezing cycle.

Each can has a bottom 4 swingable about a horizontal hinge 3 at the lower end of the can. A weight 5 secured to the bottom tends to lift and keep it in closing position. All the cans of the battery are enclosed in a common casing 6 which forms the evaporator of a refrigeration plant and is preferably covered with a heat-insulating layer. The liquefied refrigerant enters the evaporator in its lower part through a conduit 7. An outlet duct 8 is connnected to the upper part of the evaporator. In the normal operation of the machine the evaporated refrigerant is sucked off through the duct 8 and recycled to the compressor. In the thawing stage warm gaseous is admitted under pressure through duct 8 into the evaporator 6 and heats the latter in order to flow off through conduit 7.

The cans are supplied with water from tanks 9, each can from its own separate tank. The tanks are preferably arranged to hold in store just the amount of water required for one charge of a can, for which purpose they may be fitted with float valves, overflows or any other device preventing their being filled above a predetermined level. Each can has a removable lid 10 with tubular inlet 11 which is connected to the outlet 13 of the water tank through a rubber hose 12 including a valve or cock 14. In one of the cans,

e.g. in can 2, a sensitive thermostat 15 is located. This controls an electric relay. The thermostat is positioned substantially in the axis of the can slightly below the level up to which the ice block rises by expansion. At this place the salts dissolved in the water collect during the freezing operation whereby the freezing point of the brine at this point drops progressively as the freezing proceeds, and a conical cavity filled with brine comes into being in the ice block. The thermostat dips into this cavity. When here the temperature has dropped to a predetermined degree, e.g. −1° C., the thermostat enters into operation and operates a four-way valve 22 arranged in the main refrigerant conduit and controlling the flow of the refrigerant both from the compressor to the evaporator, and its return from the evaporator to the compressor. During the normal operation of the machine this valve is so set that the refrigerant flows through conduit 7 into the evaporator 6, and from the latter through duct 8 back to the compressor. When, however, the thermostat shifts the valve 22 at the end of a freezing cycle, hot gaseous refrigerant is made to flow under pressure from the compressor through duct 8' into the evaporator which it traverses in order to leave through duct 7 into a collecting vessel. On the outer face of the battery a mechanical switch 16 is provided. When the bottom 4 is swung open, the weight 5 strikes against this switch (see can 1). The operation of this switch makes the valve 22 return into normal operating position.

A further thermostat 17 is located in the immediate neighbourhood of the can bottom and controls a relay 23 which opens the water supply valves 14 when the temperature within range of this thermostat has dropped to a pre-determined degree.

Chutes 18 located beneath the battery catch the ice blocks as they fall out of the cans and guide them onto tables 19 where they abut against springy or yielding stops 20. The chutes 18 can be provided with spring-loaded braking members 21 which are pushed back by the ice block into corresponding recesses of the chute and brake its fall.

The machine described hereinbefore operates as follows:—

At the beginning of the cycle the bottoms are held against the lower end of the cans by the weights 5. The refrigerant is admitted and evaporates and the quick drop of temperature in the bottom zone freezes residual moisure on the bottoms and makes these firmly stick to the cans. When the drop of temperature operates the thermostat 17 and thereby the water valves 14 the cans are filled with water up to a height about one tenth less than the height finally occupied by the ice blocks. The thermostat 17 is adjusted to a deep temperature such as it occurs in the bottom zone soon after the beginning of the admission of the refrigerant, e.g. −5° C. Shutting of the valves 14 may afterwards again be effected by thermostatic control.

When the water has frozen and the temperature in the brine-filled cavity in the upper part of the ice block has dropped to the temperature to which the thermostat 15 has been set, this thermostat enters into operation and switches the valve 22 into a position in which hot gaseous refrigerant is conducted into duct 8, thus interrupting the freezing operation and starting thawing. After a short time the ice block is loosened and by its own weight pushes the bottom open (see can 1). The block drops onto the chute 18 and comes to rest against the stop 20. When swinging open the weight 5 has actuated the switch 16 whereby the thawing process is interrupted and a new freezing cycle has begun. The bottom which at once after the passage of the ice block has swung back into closing position again adheres by freezing to the can, the thermostat 17 again comes into operation, and a new working cycle begins.

The automatic control described above can be used for single cans as well for whole batteries. In its applicaton to batteries it will as a rule be sufficient to arrange only one thermostat 15, one thermostat 17 and one switch 16 for the whole battery.

Within the scope of the invention many modifications may be effected in the embodiment illustrated. For example, the weight 5 can be replaced by a spring. In this case an abutting member has to be provided for operatng the switch 16. For certain operations time switches may replace the thermostatic control, for example, in connection with the closure of the valves in the water supply duct, since under equal pressure conditions the flowing-out of equal amounts of water requires always equal portions of time. In principle an ice-making machine provided with swingable bottoms according to the present invention admits of a fully automatic operation by means of control members of most various description since the ice blocks leave the cans under their own weight and the bottoms return at once into closing position which makes it possible for the machine to be started again at once. Accordingly, as far as an

ice machine having swingable bottoms in accordance with the invention is at all made to operate in a fully automatic way it is not confined to the selection of certain thermostats, time switches or other control members.

What I claim is:—

1. A method of producing ice blocks in and harvesting from an upright mould having a bottom adapted to swing about a horizontal axis, consisting in holding the said bottom lightly closed against the mould and commencing the freezing action prior to or simultaneously with filling the mould, to cause the said bottom to adhere to the mould by the freezing of residual liquid or liquid introduced into the mould, and subsequent to the formation of an ice block, commencing a thawing action to cause the block to become detached from the mould and to displace the said bottom.

2. A method according to claim 1 wherein the change from a freezing to a thawing action after a block has been formed is effected by a thermostatic control.

3. A method according to claim 1 or 2 wherein the displacement of the said bottom causes the thawing action to be changed back into a freezing action.

4. A method according to claim 3 wherein after the discharge of an ice block a predetermined quantity of fresh liquid is admitted to the mould.

5. A method according to claim 2 wherein the said thermostatic control is set to operate at a temperature slightly below the freezing point of mains water and has its temperature sensitive element located in that zone of the liquid in the mould where during the freezing action the salt content tends to concentrate.

6. A machine for carrying out the method according to any of the preceding claims comprising one or more upright moulds associated in direct heat exchange relationship with the evaporator of a refrigeration plant, each mould having a bottom adapted to swing about a horizontal axis and means for normally holding each of said bottoms in its closed position, said means being capable of being overcome to allow each bottom to swing open automatically when the weight of an ice block is applied thereto.

7. A machine according to claim 6 wherein the means for normally holding each bottom closed against its mould comprise a counter-weighting device attached to each bottom.

8. A machine according to claim 7 wherein at least one of said bottoms on being swung open by an ice block is arranged to operate an electric switch device which causes the thawing action to be changed back into a freezing action.

9. A machine according to any of claims 6 to 8 wherein a water supply duct provided with a valve is connected to each mould, said valve being operated by a thermostatic control means to admit a predetermined quantity of water to the mould after the discharge of an ice block therefrom.

BREWER & SON,
Chartered Patent Agents,
5—9, Quality Court, Chancery Lane,
London, W.C.2.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1953.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

691,197
1 SHEET

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.